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AUTHOR Sparapani, Ervin F.; Edwards, Peter
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ABSTRACT

The Thinking/Learning System is designed to provide students at all educational levels with learning experiences based on conceptual frameworks which transcend the limitations of content. The system was developed around four specific thinking skills (information gathering, critical thinking, decision making, and creative thinking) that are essential elements of effective thinking. Independent thinking is addressed through the freedom of choice and mode of expression allowed the individual. The role of the teacher is to guide and direct students to select appropriate and challenging experiences. The system enables teachers to cope realistically with the number and variety of learning materials available to students. The Thinking/Learning System was developed to give students the opportunity to develop the higher-order thinking skills and innovative techniques that will allow them to meet the challenge posed by a complex, technological world. (Contains 14 references and three figures illustrating aspects of the system.) (RS)

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The Thinking/Learning System: A Brain-Compatible Strategy for Effective Teaching of Higher-Order Thinking and Learning

Ervin F. Sparapani, Associate Professor
College of Education
Saginaw Valley State University

Peter Edwards, Professor
College of Education
SUNY Plattsburgh

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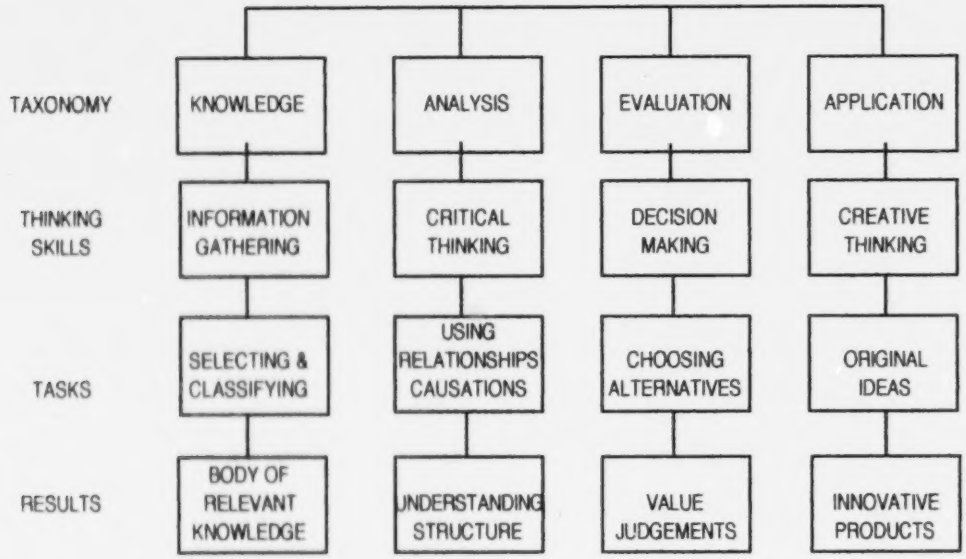
INTRODUCTION

Classroom teachers are faced, daily, with students who have a variety of abilities, interests, and levels of achievement, much more so today than in years past. Teachers, therefore, need to be increasingly knowledgeable of methodologies that aid in the challenge of individualization. Also, teachers need to understand how various learning processes integrate to form workable instructional strategies that "lead to the formation of usable knowledge structures" (Derry, 1988/1989, p. 5). Paul (1989/p. 62) claims teachers need to "...redesign lessons so that they'll encourage more critical thinking on the part of the students." Resnick (see Brandt, 1988/1989, p. 15) says, "We have to figure out how to teach in ways that don't just 'impart' knowledge, but instead helps students to construct their own interpretation." The Thinking/Learning System (see Figure 1) provides teachers with the means to apply what Derry, Paul, and Resnick are suggesting.

The Thinking/Learning System is an instructional paradigm that couples selected levels of Bloom's taxonomy with selected higher-order thinking processes. The system, developed from earlier works of Edwards (1970) and Edwards and Sparapani (1991), gives teachers (a) flexibility in adapting assignments to individual needs of students by (b) expecting students to independently and/or cooperatively apply left-, right-, and whole-brain processes, while (c) using specific thinking skills.

Figure 1

THE THINKING/LEARNING SYSTEM



THE THINKING/LEARNING SYSTEM

The Thinking/Learning System has been developed around four specific thinking skills (information gathering; critical thinking; decision making; creative thinking) that its developers believe are essential elements of effective thinking. As Beyer (1988, p[. 15) recommends, "it is better to include a few important thinking skills processes in a system for teaching thinking skills than to include so many that the result is too much confusion for both teacher and student." The Thinking/Learning System attempts to reflect that recommendation.

The Thinking/Learning System is designed to fit any content, material, or educational level. Each strand allows teachers and/or students to choose which type of learning experience is more relevant to their needs for a particular situation. The following explains the strands of the Thinking/Learning System and provides an indication of how each

strand is applied.

Knowledge/Information Gathering: In this strand, students gain a body of relevant knowledge for selecting and/or classifying information which will serve as the foundation for future activities in that lesson. Students gain a basic understanding of specifics, terminology, trends, categories, and methodology of a subject.

Analysis/Critical Thinking: This strand focuses on the importance of relationships and causes. Students learn to investigate the discrete elements of an issue or topic through an examination of the organizational principles involved. Students also learn how to reconstitute those principles into new or unique sets of operations.

Evaluation/Decision Making: This strand emphasizes the choosing of alternatives and making value judgements based on internal evidence and/or external criteria.

Application/Creative Thinking: In this strand, students use original ideas to develop innovative products that are then implemented to determine the products' adequacy.

Each strand (Knowledge/information gathering; analysis/critical thinking; evaluation/decision making; application/creative thinking) involves activities and/or experiences selected from the Activities Selection Form.

Figure 2

THE THINKING LEARNING SYSTEM

Activities Selection Form

SUBJECT:_____ NAME:_____

TOPIC:_____ DATE:_____

MAJOR OBJECTIVE:

Specific Objectives:

1. Knowledge:
   - (a)
   - (b)
   - (c)
2. Analysis:
   - (a)
   - (b)
   - (c)
3. Evaluation:
   - (a)
   - (b)
   - (c)
4. Application:
   - (a)
   - (b)
   - (c)

Activities/experiences in each strand emphasize left-brain, right-brain, or whole-brain operations. Except for the activities/experiences under knowledge/information gathering, it is not expected that students do all activities. After knowledge, students (with teacher guidance and direction) perform at least one activity in each of the other strands. The key for the teacher is to consider individual differences and, therefore, make sure that a variety of activities are selected.

When using the Thinking/Learning System, it is important to remember that the strands are neither linear nor sequential. Knowledge is basic and fundamental to the system. Analysis, evaluation, and application branch from knowledge similar to the spokes of a wheel. Consequently, students can select their learning in a manner similar to the mental functioning of the brain (Hart, 1983; Restak, 1984).

An example of the use of the Thinking/Learning System with a topic in Literature is shown in Figure 3.

Figure 3
THE THINKING/LEARNING SYSTEM
LITERATURE

TOPIC:_____ NAME:_____

DATE:_____

Major Objective:

To develop reading and higher-order thinking skills through the use of literature. Select one of the following : a novel/short story, genre, theme, poem, or an author. Print you name and date and the title of your selection alongside the topic (above).

NB: Talk to your teacher about how much of the following you should do.

Specific Objectives:

1. **Knowledge**
   - (a) Write down some of the words that you found hard to understand. Use a dictionary or glossary to help you understand these words.
   - (b) Draw a schema to show how you could group certain types of words (nouns, verbs)
   - (c) Use the words that you have chosen in the schema.
2. **Analysis**
   - (a) Write down the main characters and main incidents in the selection.
   - (b) Choose a graph type to show how you could plot the importance of the main incidents in the selection.
   - (c) Construct a graph to show the importance of the main incidents in the selection.
3. **Evaluation**
   - (a) State reasons to show why you liked or didn't like the selection.
   - (b) Draw a barometer to show how you could give your opinion of the selection.
   - (c) Fill in and label the barometer to show your level of interest in the selection.
4. **Application**
   - (a) Write a short description of the selection for use as a book cover or for a talk on the radio or television.
   - (b) Plan an outline of a collage or visual presentation (photos, drawings, pictures, etc.) to tell others about the selection.
   - (c) Illustrate your writing in the collage or visual presentation you have planned.

In the **Knowledge** category, the student first is asked to brainstorm and think of relevant information which could be used in the thinking/learning process. The information is usually basic building blocks of language such as vocabulary or specific symbolic aspects of Math, Science or other subjects. This may take the form of, "Write down all the difficult words from the reading selection", or "Write down the equations involved in the experiment". A higher level thinking skill could require questions which asked, " What figures of speech are used in the story?" or "What type of chemical reactions took place in the experiment?" These linear type activities are part of the Content category and involve left brain functioning.

The students are next invited to think of the best type of schemata in which to organize the related information. This may take the form of a schemata such as webbing, a list, or a type of flowchart. This activity could be stated as, "Think of a schema to arrange the words you selected", or, "How would you sequence the equations you chose?" A higher level thinking skill might require students to compare or contrast various aspects of the information in creative or innovative arrangements. This second section (Organization) involves right brain activity and makes use of spatial relationships and graphic organizations.

The final step in the **Knowledge** category is a whole-brain activity (Presentation) which combines the first and second operations. This asks the students to place the information gained in the first step into the organizational framework developed in the second step: eg. "Arrange in the schema, the words you selected ", or "Show the sequence of equations in a flowchart".

This series of steps is summarized below and applies to a topic in English Literature.

A. Knowledge

Content	1. Write down the words you found difficult to understand.
Organization	2. Construct a schema to group the different types of words.

Presentation 3. Place the words you selected into the schema.

In practice, these parts of the T/L System might appear as the following:

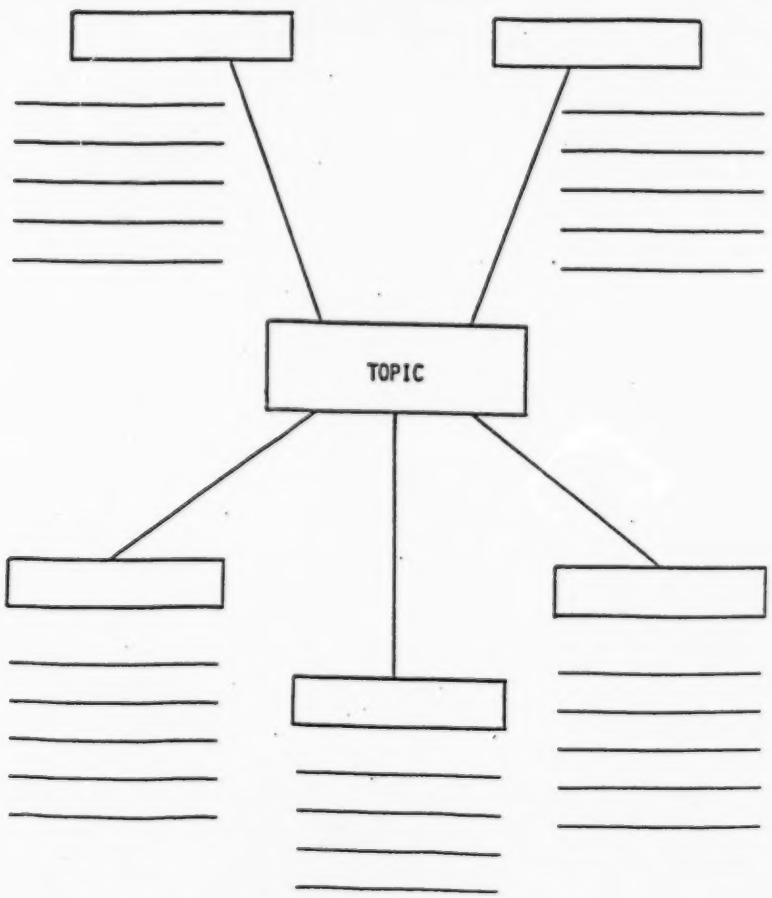
A. Knowledge

1. Content

hero, serpent, shields, Mediterranean Sea, Greece, scaly, soldiers, swords, ancient, tentacles, warriors, spears, Crete, hideous, vicious, sailors.

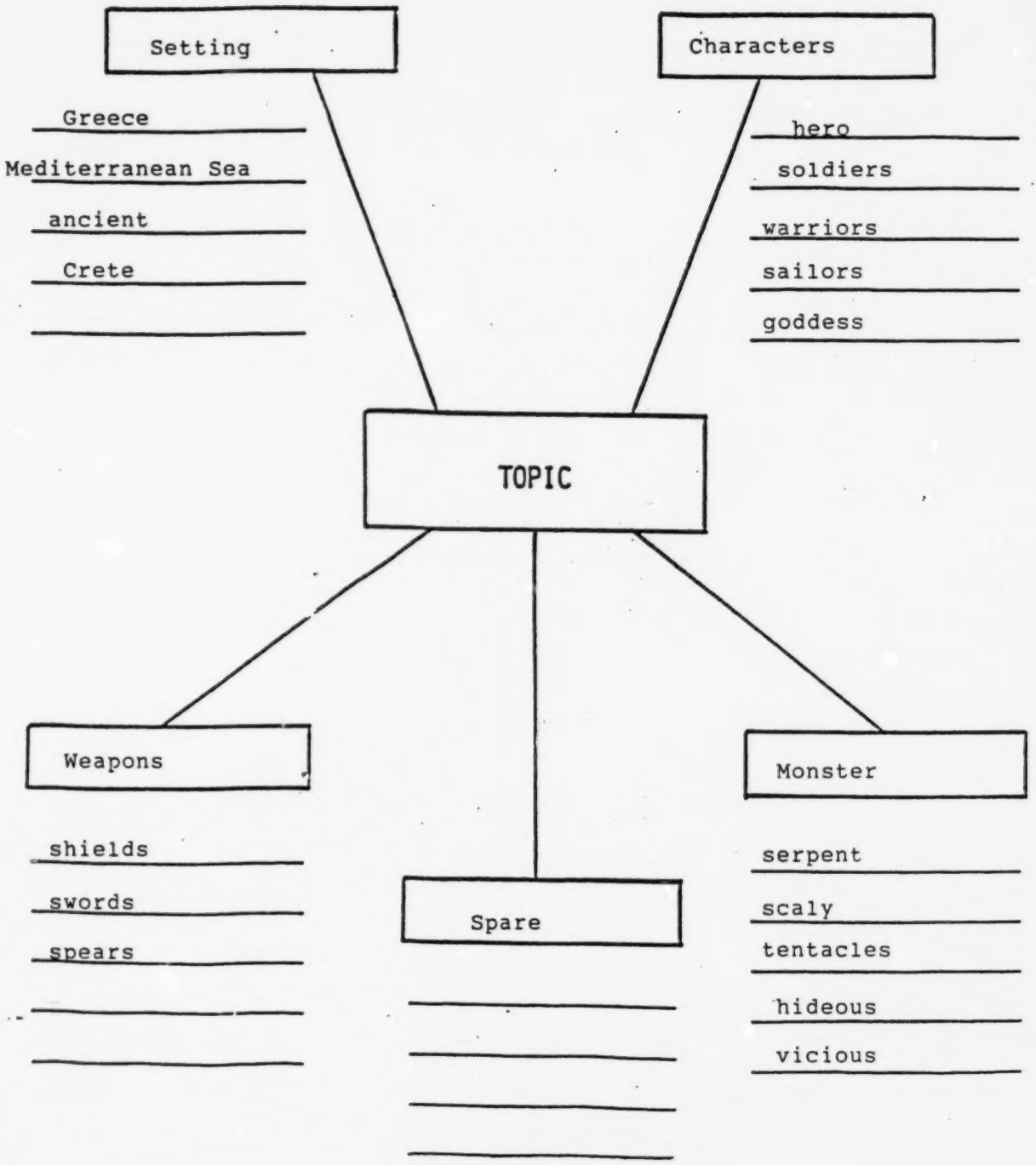
2. Organization

Schema



3. Presentation

Schema



CONCLUSION

The Thinking/Learning System is designed to provide students with learning experiences based on conceptual frameworks which transcend the limitations of content. Independent thinking is addressed through the freedom of choice and mode of expression allowed the individual. The role of the teacher, however, is still of paramount importance in guiding and directing students to select appropriate and challenging experiences. The Thinking/Learning System provides numerous, on-going opportunities for teachers to have meaningful dialogue with students regarding their education needs and progress. The strategy also enables teachers to cope realistically with the ever-increasing number and variety of learning materials available to students today.

In the new age of teacher preparation, it is becoming increasingly obvious that teachers need instructional models that give students the opportunity to develop the higher-order thinking skills and innovative techniques that will allow them to meet the challenge posed by a complex, technological world. It is with this goal in mind that the Thinking/Learning System has been developed.

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